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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/293,188	04/16/1999	ZHIPING YIN	11675.165.1	4546
24247	7590	12/13/2005	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			CAO, PHAT X	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/293,188

Applicant(s)

YIN ET AL.

Examiner

Phat X. Cao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 31-48 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 31-48 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Request for Continued Examination filed on 9/23/05 is acknowledged.
2. The cancellation of claims 1-30 in Paper filed on 9/23/05 is acknowledged.

Claim Objections

3. Claim 39 is objected to because of the following informalities:

In claim 39, lines 2-3, a phrase "the electrically conductive film" should be changed to "the electrically conductive material".

Appropriate correction is required.

4. Claims 33-38, 41-44, and 46-48 are objected to because of the following informalities:

- In claims 33-34 and 36-38, lines 1-2, a phrase "wherein reacting a chemical composition with an upper surface of the electrically conductive material..." should be changed to "wherein reacting **said** chemical composition with **said** upper surface of the electrically conductive material...".

- In claim 35, lines 1-2, a phrase "wherein reacting a nitrogen-containing composition..." should be changed to "wherein reacting **said** nitrogen-containing composition...".

- In claims 41-44, lines 1-2, a phrase "wherein adsorbing a chemical composition onto an upper surface of the electrically conductive material..." should be changed to "wherein adsorbing **said** chemical composition onto **said** upper surface of the electrically conductive material...".

- In claims 46-48, lines 1-2, a phrase "wherein reacting a chemical composition with at least one monolayer of an upper surface of an electrically conductive material..." should be changed to "wherein reacting **said** chemical composition with at least one monolayer of **said** upper surface of **said** electrically conductive material..."

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 31-34, 36-38, 40-44, and 45-48 are rejected under 35 U.S.C. 102(e) as being anticipated by Sekiguchi et al (US. 5,780,908).

Regarding claims 31, 33-34, 36, 40-43, and 45-47, Sekiguchi (Figs. 3a-3b) discloses a method of forming an electrically conductive structure, comprising: forming a first dielectric layer 4 on a silicon semiconductor structure 1, the first dielectric layer 4

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comprising a depression 5 therein; filling the depression 5 with an electrically conductive material 7 of tungsten; and reacting a chemical composition with an upper surface of the tungsten electrically conductive material 7 by exposing the surface of the tungsten conductive material 7 to plasma in an atmosphere of nitride (column 12, lines 31-37) or ammonia (NH₃) (column 15, lines 50-54) for nitriding an area in the vicinity of the surface of the tungsten conductive material 7 to form a chemical compound layer 7b of tungsten nitride (column 12, lines 35-37), wherein the plasma in an atmosphere of ammonia allows ions of ammonia (NH₃) to enter or adsorb the tungsten conductive material 7 (column 11, lines 28-35).

It is noted that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. *In re Best*, 195 USPQ 430, 433 (CCPA 1977). Therefore, the tungsten nitride chemical compound layer 7b of Sekiguchi would have properties of providing more resistant to oxidation than the tungsten conductive material 7 because the chemical compound layer 7b of Sekiguchi is substantially identical in structure or composition (i.e., tungsten nitride) to the chemical compound layer 32 of Applicant (see page 11 of Applicant's specification, lines 4-7) and because the chemical compound layer 32 of Applicant is produced by substantially identical processes (i.e., exposing the surface of tungsten refractory material to plasma in an atmosphere of ammonia, NH₃).

Regarding claims 32, 37 and 48, as discusses above, Sekiguchi (Figs. 3a-3b) also discloses that the depression 5 is filled with a tungsten refractory metal 7, and the

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tungsten nitride 7b on the upper surface of the tungsten refractory metal 7 is formed by reacting the chemical composition of ammonia (NH₃) with the upper surface of the tungsten refractory metal 7 (column 12, lines 31-37 and column 15, lines 50-54).

Regarding claims 38 and 44, Sekiguchi further discloses that heating the first dielectric layer 4 to a temperature of 50 degrees Celsius, and exposing the upper surface to the nitrogen-containing composition to form the chemical compound layer 7b of tungsten nitride (column 12, lines 31-37).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al in view of Liao (US. 6,114,238).

Sekiguchi does not disclose the forming of a second dielectric layer over the conductive material and the first dielectric layer, and being adhered to the conductive material.

However, Liao (Fig. 2D) teaches the forming of a second dielectric layer 108 (not shown in Fig. 2D, see Fig. 1) over the conductive material 212a and the first dielectric layer 202. Accordingly, it would have been obvious to form an inter-layer dielectric or a second dielectric layer over the conductive material 7b and the first dielectric layer 4 of Sekiguchi because the inter-layer dielectric would function as a passivation layer for the

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known purpose of isolating and protecting the electrically conductive interconnect from the outside ambient.

9. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al (US. 5,780,908).

Sekiguchi does not disclose that the upper surface of the conductive material is exposed to the nitrogen-containing composition for approximately 30 seconds.

However, Sekiguchi (Fig. 3b) also teaches that the upper surface of the conductive material 7 is exposed to the nitrogen-containing composition for approximately 1 minute (column 12, lines 31-37). Accordingly, it would have been obvious to expose the upper surface of the conductive material 7 of Sekiguchi to the nitrogen-containing composition for a period of time as claimed because the period of time for exposing the upper surface of the conductive material can be optimized during routine experimentation depending upon the desired resistance and the desired thickness required for the chemical compound layer formed on the upper surface of the conductive material.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is 571-272-1703. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC
December 9, 2005


PHAT X. CAO
PRIMARY EXAMINER